OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **LEES POND** the program coordinators recommend the following actions. *We would like to encourage the association to conduct more sampling events in the future. With a limited amount of data it is difficult to determine water quality trends. Since weather patterns and activity in the watershed can change throughout the summer it is a good idea to sample the lake several times over the course of the season.*

FIGURE INTERPRETATION

- Figure 1: The chlorophyll-a sample collected this season was not analyzed due to laboratory error. Algal abundance seems to be remaining relatively stable in the lake, and we hope to see this continue next season. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *fairly stable* trend in lake transparency. Transparency decreased slightly this season, however, it is difficult to accurately assess the clarity trends in the lake because clarity is measured only once per summer. Clarity has been below the state mean since 1992. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *stable* trend for epilimnetic phosphorus levels and a *variable* trend for the hypolimnetic concentrations. The elevated concentration in the hypolimnion could have been caused by elevated turbidity in the sample. Contamination of the sample with bottom sediment can yield inaccurate phosphorus data. The phosphorus concentration in the epilimnion decreased from last season, and is the lowest the lake has experienced in eight years. The epilimnetic concentration was below the state median this year, while the concentration in the hypolimnion was above the state median. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- Conductivity remains relatively low at all stations of the pond (Table 6). Conductivity increases often indicate the influence of human activities on surface waters. This stable trend is a positive sign. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity.

- Dissolved oxygen was low at the bottom of the pond in July (Table 9), which may have been a result of testing to close to the bottom. However, oxygen has been low at the bottom in the past. The process of decomposition in the sediments depletes dissolved oxygen on the bottom of the lake. As bacteria break down organic matter, they deplete oxygen in the water. When oxygen gets below 1 mg/L, phosphorus normally bound up in the mud may be released into the water column, a process that is referred to as *internal loading*. Depleted oxygen in the hypolimnion usually occurs as the summer progresses, and oxygen depletion occurred in the last meter of the pond this season. This could explain the higher phosphorus in the hypolimnion (lower water layer) versus the epilimnion (upper layer).

- The total phosphorus concentration in the Inlet was lower than last year's result (Table 8). While this is a positive sign of declining external nutrients, it is difficult to understand the quality of a body of water with only one sample collected per summer. We suggest expanding the sampling program to include at least two more samples during the summer. Recently, a science teacher at the Moultonborough Academy contacted the VLAP interim coordinator to discuss the possibility of her science class conducting tests on Lees Pond. At this time, no word has been received from the teacher as to whether she would like to examine this further. We will keep you up to date on the developments.

NOTES

- Monitor's Note (7/6/00): Milfoil much thicker this year, especially around inlet.

- Biologist's Note (7/6/00): Chlorophyll-a misplaced, not run.

USEFUL RESOURCES

Lake Eutrophication, *WD-BB-3*, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, *WD-BB-9*, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

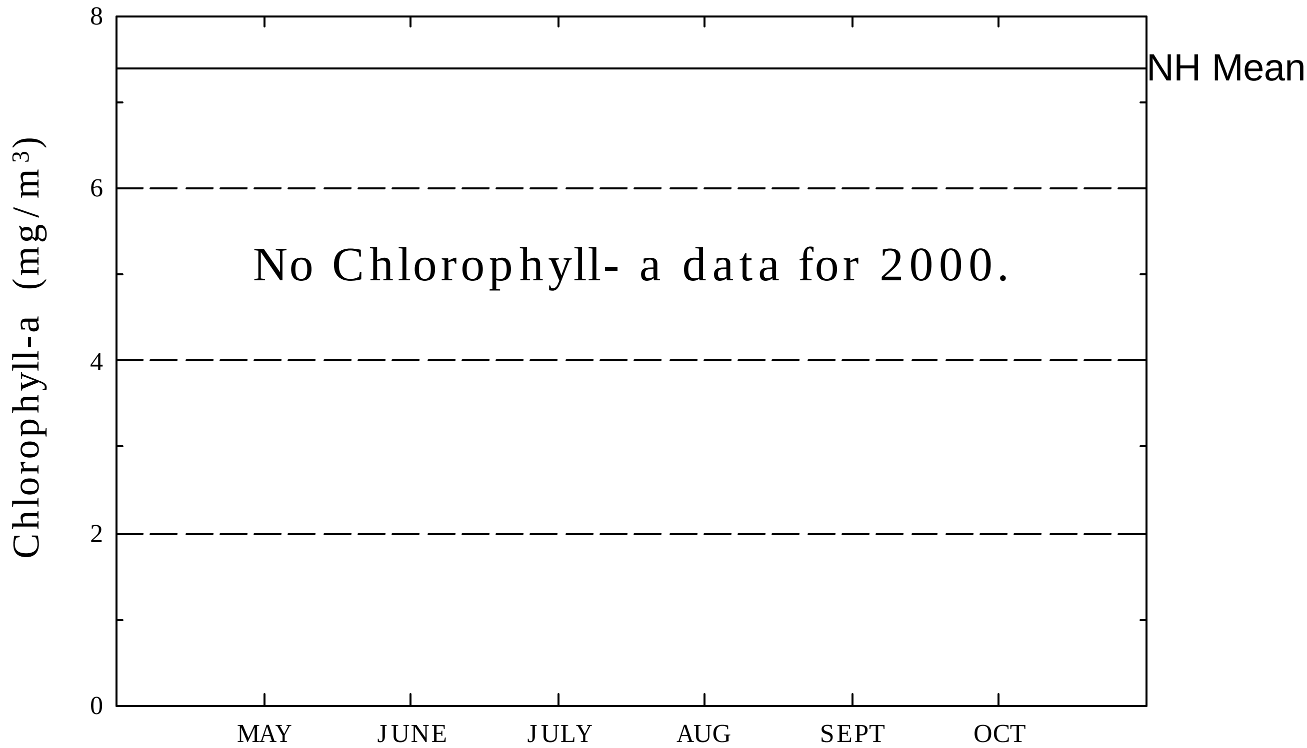
Anthropogenic Phosphorus and New Hampshire Waterbodies, *NHDES-WSPCD-95-6*, NHDES Booklet, (603) 271-3503

Through the Looking Glass: A Field Guide to Aquatic Plants. North American Lake Management Society, 1988. (608) 233-2836 or www.nalms.org

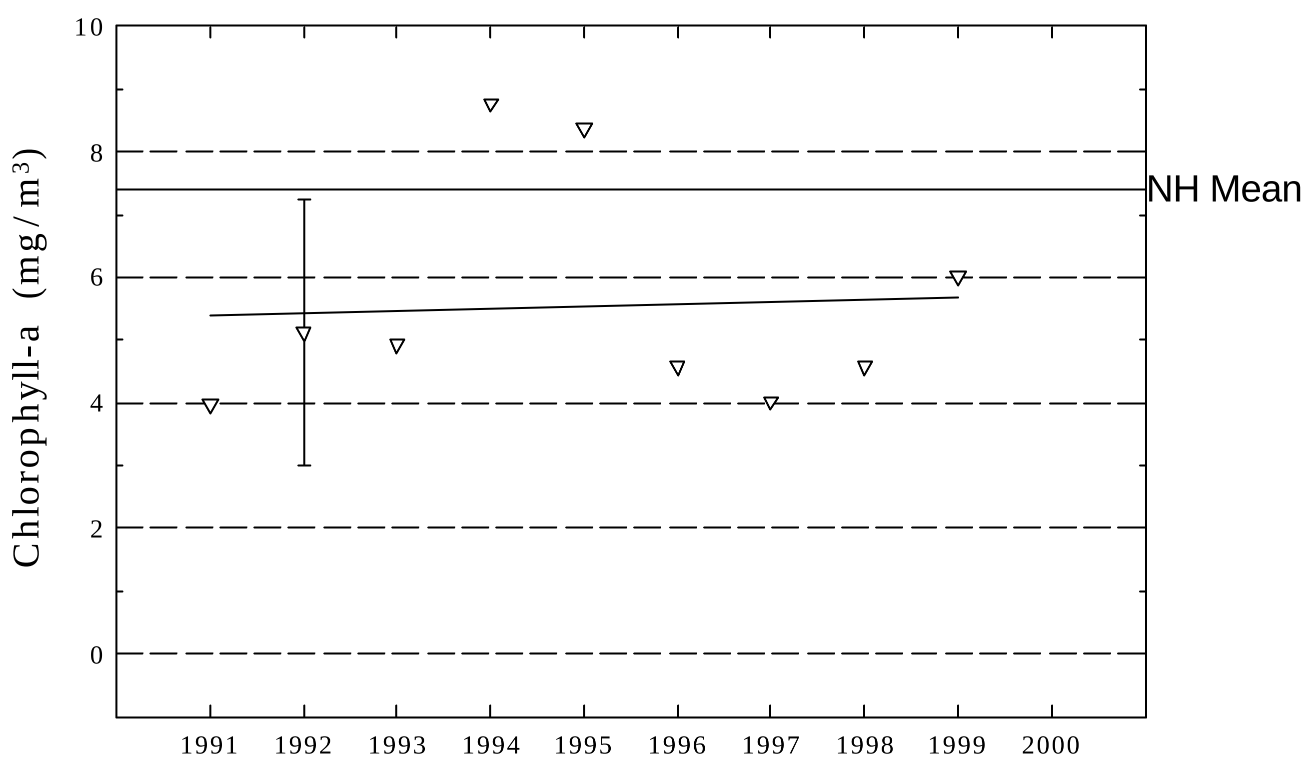
Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

Lees Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



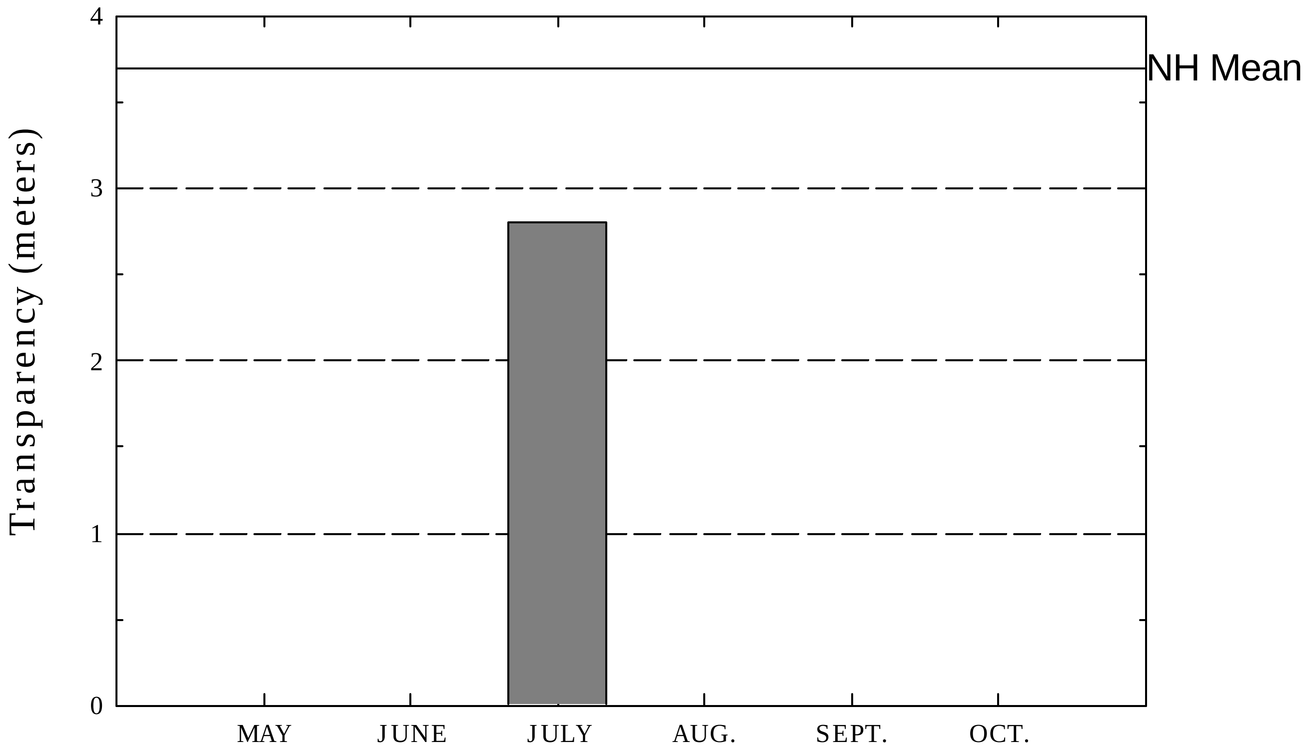
2000 Chlorophyll-a Results



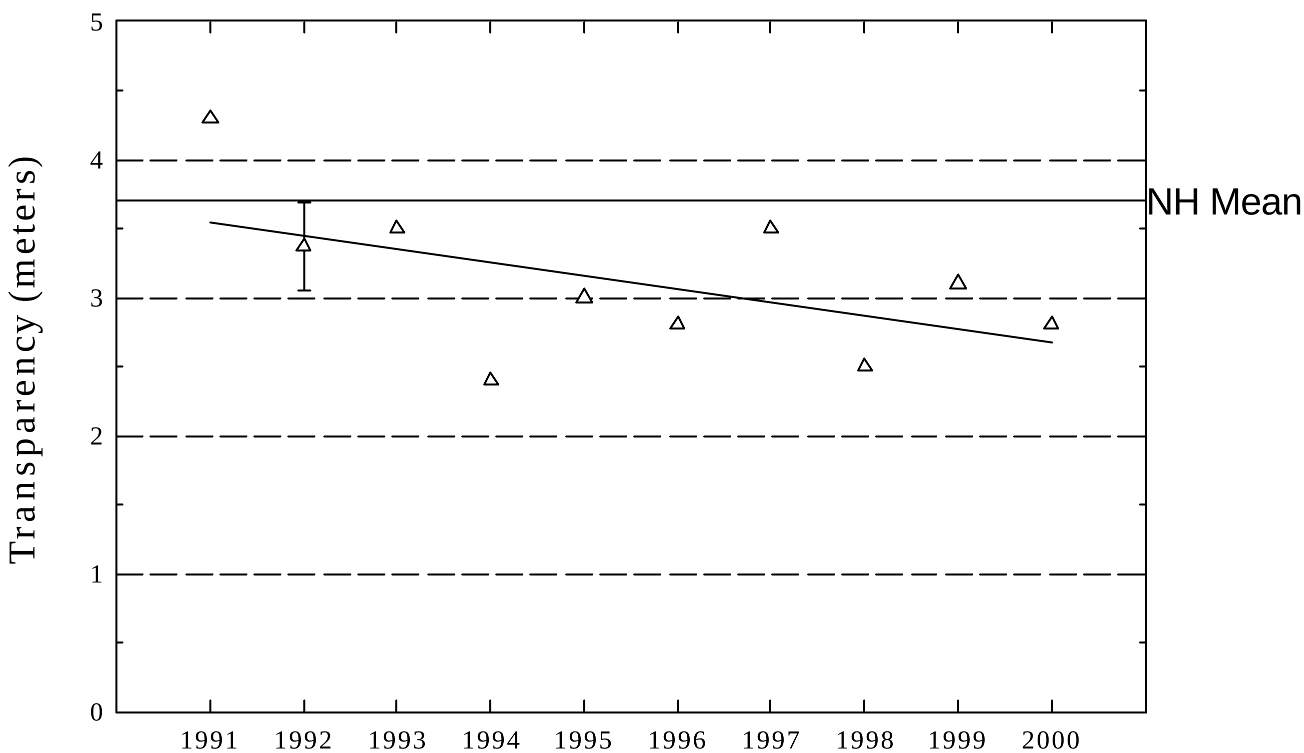
Historical Chlorophyll-a Results

Lees Pond

Figure 2. Monthly and Historical Transparency Results



2000 Transparency Results



Historical Transparency Results

Lees Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

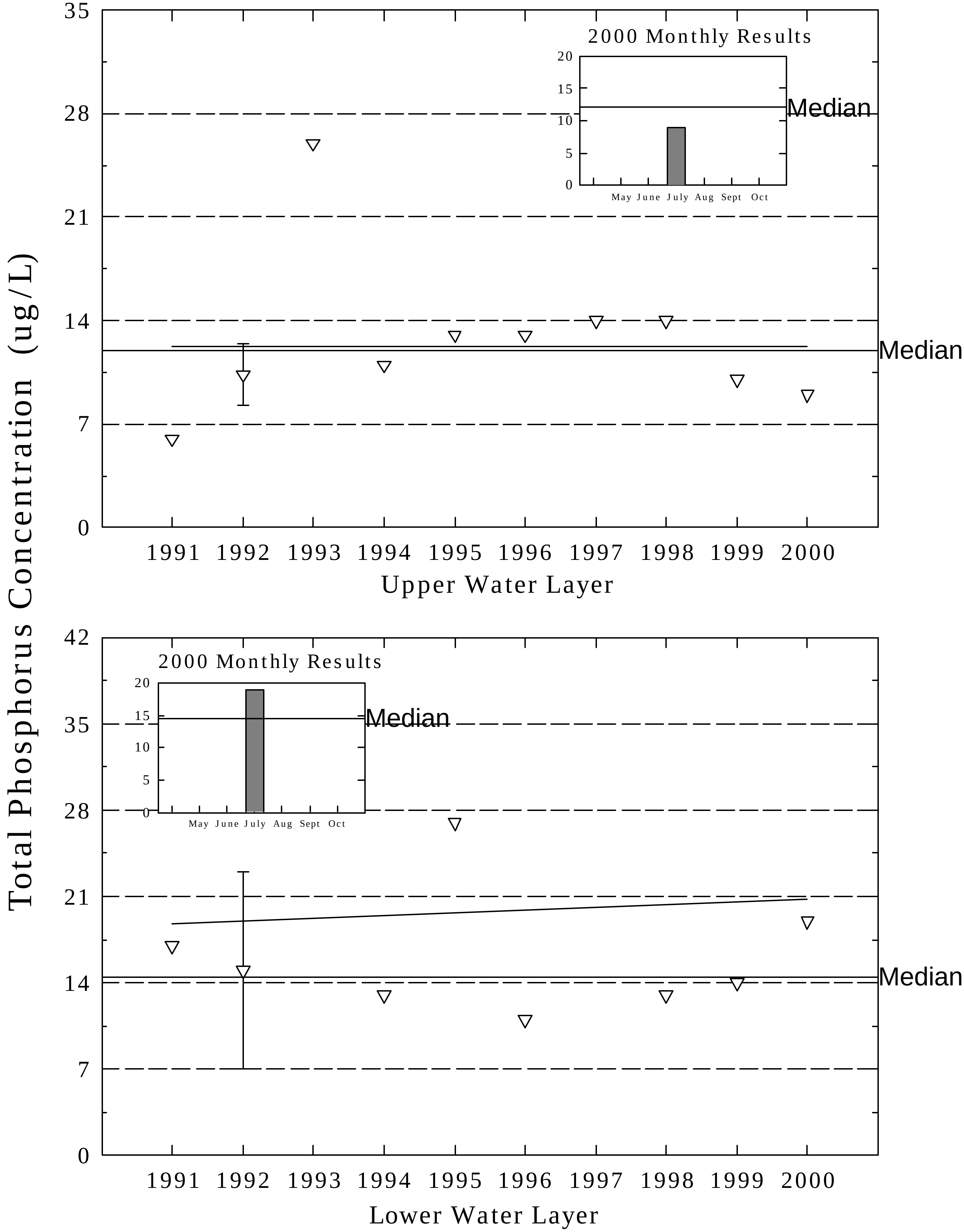


Table 1.

LEES POND

MOULTONBORO

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1991	3.98	3.98	3.98
1992	3.11	7.32	5.12
1993	4.93	4.93	4.93
1994	8.77	8.77	8.77
1995	8.37	8.37	8.37
1996	4.58	4.58	4.58
1997	4.03	4.03	4.03
1998	4.58	4.58	4.58
1999	6.02	6.02	6.02

Table 2.

LEES POND

MOULTONBORO

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
08 / 05 / 1991	CERATIUM	35
	TABELLARIA	18
	DINOBRYON	13
06 / 29 / 1992	DINOBRYON	37
	ASTERIONELLA	24
	SYNURA	10
09 / 04 / 1992	ASTERIONELLA	69
	TABELLARIA	20
06 / 30 / 1994	RHIZOSOLENIA	63
	ASTERIONELLA	15
	DINOBRYON	10
07 / 01 / 1996	CHRYSOSPHAERELLA	43
	DINOBRYON	24
	MALLOMONAS	12
07 / 01 / 1997	DINOBRYON	85
	ASTERIONELLA	9
	MELOSIRA	2
07 / 02 / 1998	SYNURA	30
	TABELLARIA	29
	ASTERIONELLA	11
07 / 20 / 1999	SYNURA	23
	CERATIUM	21
	COELOSPHAERIUM	16
07 / 06 / 2000	DINOBRYON	56
	CHRYSOSPHAERELLA	38
	SYNURA	2

Table 3.

LEES POND

MOULTONBORO

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1991	4.3	4.3	4.3
1992	3.0	3.6	3.3
1993	3.5	3.5	3.5
1994	2.4	2.4	2.4
1995	3.0	3.0	3.0
1996	2.8	2.8	2.8
1997	3.5	3.5	3.5
1998	2.5	2.5	2.5
1999	3.1	3.1	3.1
2000	2.8	2.8	2.8

Table 4.

LEES POND
MOULTONBORO

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1991	7.10	7.10	7.10
	1992	6.92	7.06	6.97
	1993	6.95	6.95	6.95
	1994	6.86	6.86	6.86
	1995	7.11	7.11	7.11
	1996	6.63	6.63	6.63
	1997	7.10	7.10	7.10
	1998	6.48	6.48	6.48
	1999	7.04	7.04	7.04
	2000	7.00	7.00	7.00
HYPOLIMNION				
	1991	6.20	6.20	6.20
	1992	6.22	6.85	6.36
	1993	6.15	6.15	6.15
	1994	6.14	6.14	6.14
	1995	6.46	6.46	6.46
	1996	6.12	6.12	6.12
	1997	6.20	6.20	6.20
	1998	5.92	5.92	5.92
	1999	6.19	6.19	6.19
	2000	6.30	6.30	6.30
INLET				
	1991	6.40	6.40	6.40
	1992	6.68	7.29	6.89
	1993	6.86	6.86	6.86

Table 4.

LEES POND
MOULTONBORO

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1994	6.81	6.81	6.81
	1995	6.64	6.64	6.64
	1996	6.60	6.60	6.60
	1997	6.47	6.47	6.47
	1998	6.41	6.41	6.41
	1999	6.50	6.50	6.50
	2000	6.80	6.80	6.80
METALIMNION				
	1992	5.84	6.42	6.13
	1993	6.75	6.75	6.75
	1994	6.78	6.78	6.78
	1995	6.46	6.46	6.46
	1996	6.63	6.63	6.63
	1997	6.32	6.32	6.32
	1998	6.02	6.02	6.02
	1999	6.37	6.37	6.37
	2000	6.33	6.33	6.33
OUTLET				
	1991	7.20	7.20	7.20
	1992	6.95	7.06	7.00
	1993	7.05	7.05	7.05
	1994	7.14	7.14	7.14
	1995	7.07	7.07	7.07
	1996	6.76	6.76	6.76
	1997	7.04	7.04	7.04
	1998	6.46	6.46	6.46
	1999	6.94	6.94	6.94
	2000	7.06	7.06	7.06

Table 5.

LEES POND

MOULTONBORO

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1991	8.60	8.60	8.60
1992	9.40	12.60	11.27
1993	9.30	9.30	9.30
1994	8.70	8.70	8.70
1995	12.30	12.30	12.30
1996	10.40	10.40	10.40
1997	8.80	8.80	8.80
1998	7.90	7.90	7.90
1999	10.80	10.80	10.80
2000	11.60	11.60	11.60

Table 6.

LEES POND
MOULTONBORO

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1991	49.8	49.8	49.8
	1992	51.3	54.4	52.5
	1993	51.3	51.3	51.3
	1994	51.2	51.2	51.2
	1995	55.0	55.0	55.0
	1996	50.2	50.2	50.2
	1997	49.2	49.2	49.2
	1998	36.6	36.6	36.6
	1999	53.4	53.4	53.4
	2000	53.7	53.7	53.7
HYPOLIMNION				
	1991	45.1	45.1	45.1
	1992	49.8	55.6	52.8
	1993	42.8	42.8	42.8
	1994	40.3	40.3	40.3
	1995	52.8	52.8	52.8
	1996	40.6	40.6	40.6
	1997	40.1	40.1	40.1
	1998	38.1	38.1	38.1
	1999	48.7	48.7	48.7
	2000	46.6	46.6	46.6
INLET				
	1991	59.6	59.6	59.6
	1992	52.6	54.6	53.6
	1993	54.8	54.8	54.8
	1994	55.4	55.4	55.4

Table 6.

LEES POND
MOULTONBORO

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1995	58.0	58.0	58.0
	1996	54.7	54.7	54.7
	1997	51.0	51.0	51.0
	1998	36.2	36.2	36.2
	1999	60.7	60.7	60.7
	2000	53.3	53.3	53.3
METALIMNION				
	1992	49.8	63.9	57.2
	1993	49.3	49.3	49.3
	1994	41.2	41.2	41.2
	1995	56.0	56.0	56.0
	1996	53.2	53.2	53.2
	1997	41.1	41.1	41.1
	1998	30.4	30.4	30.4
	1999	50.2	50.2	50.2
	2000	49.1	49.1	49.1
OUTLET				
	1991	49.1	49.1	49.1
	1992	51.2	52.9	52.0
	1993	51.5	51.5	51.5
	1994	51.7	51.7	51.7
	1995	55.1	55.1	55.1
	1996	51.1	51.1	51.1
	1997	47.9	47.9	47.9
	1998	34.4	34.4	34.4
	1999	53.2	53.2	53.2
	2000	54.2	54.2	54.2

Table 8.

LEES POND
MOULTONBORO

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1991	6	6	6
	1992	8	12	10
	1993	26	26	26
	1994	11	11	11
	1995	13	13	13
	1996	13	13	13
	1997	14	14	14
	1998	14	14	14
	1999	10	10	10
	2000	9	9	9
HYPOLIMNION				
	1991	17	17	17
	1992	7	23	15
	1993	34	34	34
	1994	13	13	13
	1995	27	27	27
	1996	11	11	11
	1997	43	43	43
	1998	13	13	13
	1999	14	14	14
	2000	19	19	19
INLET				
	1991	18	18	18
	1992	9	13	11
	1993	17	17	17

Table 8.

LEES POND
MOULTONBORO

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1994	16	16	16
	1995	20	20	20
	1996	17	17	17
	1997	31	31	31
	1998	13	13	13
	1999	19	19	19
	2000	15	15	15
METALIMNION				
	1992	8	11	9
	1993	11	11	11
	1994	20	20	20
	1995	14	14	14
	1996	14	14	14
	1997	21	21	21
	1998	13	13	13
	1999	8	8	8
	2000	5	5	5
OUTLET				
	1991	6	6	6
	1992	7	8	7
	1993	10	10	10
	1994	10	10	10
	1995	8	8	8
	1996	12	12	12
	1997	13	13	13
	1998	13	13	13
	1999	9	9	9

Table 8.

LEES POND

MOULTONBORO

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	2000	8	8	8

Table 9.

LEES POND

MOULTONBORO

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 6, 2000			
0.1	24.0	7.2	85.6
1.0	24.0	7.2	85.6
2.0	23.7	7.2	84.5
3.0	20.6	6.4	70.9
4.0	16.2	4.3	43.7
5.0	13.2	3.5	33.4
6.0	10.5	3.0	26.5
7.0	9.6	2.6	22.9
8.0	9.4	2.3	20.5
9.0	8.9	0.7	5.8

Table 10.

LEES POND

MOULTONBORO

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 29, 1992	9.0	6.5	2.8	22.7
September 4, 1992	10.5	6.0	0.3	2.0
July 1, 1996	8.0	8.5	0.0	0.0
July 1, 1997	8.5	9.2	1.4	12.0
July 2, 1998	9.0	7.6	1.1	9.0
July 20, 1999	8.5	9.6	0.8	6.7
July 6, 2000	9.0	8.9	0.7	5.8

Table 11.

LEES POND
MOULTONBORO

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.3	0.3	0.3
	1998	0.9	0.9	0.9
	1999	0.6	0.6	0.6
	2000	0.3	0.3	0.3
HYPOLIMNION				
	1997	1.4	1.4	1.4
	1998	1.2	1.2	1.2
	1999	3.9	3.9	3.9
	2000	1.3	1.3	1.3
INLET				
	1997	0.7	0.7	0.7
	1998	1.0	1.0	1.0
	1999	0.9	0.9	0.9
	2000	0.5	0.5	0.5
METALIMNION				
	1997	0.6	0.6	0.6
	1998	0.4	0.4	0.4
	1999	0.9	0.9	0.9
	2000	0.4	0.4	0.4
OUTLET				
	1997	0.3	0.3	0.3
	1998	0.6	0.6	0.6
	1999	0.5	0.5	0.5
	2000	0.5	0.5	0.5